

# Bentley OnSite Trial Project



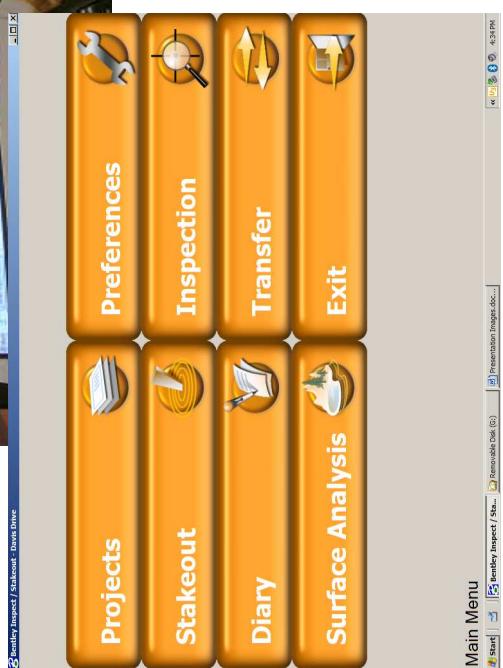
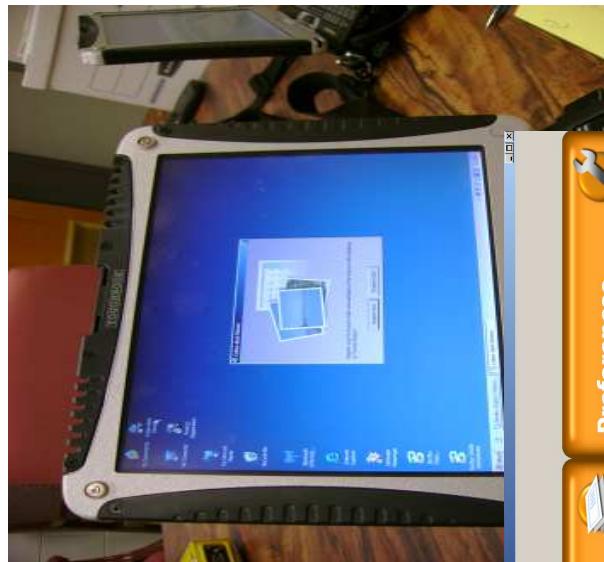
# Trial Project Summary

- Davis Drive widening (TIP U-4026)
- Major urban widening project in RTP
- Project Cost: \$35.5 million
  - 6.4 miles long
- Work includes grading, drainage, culverts, and signals
- Significant development and utility conflicts



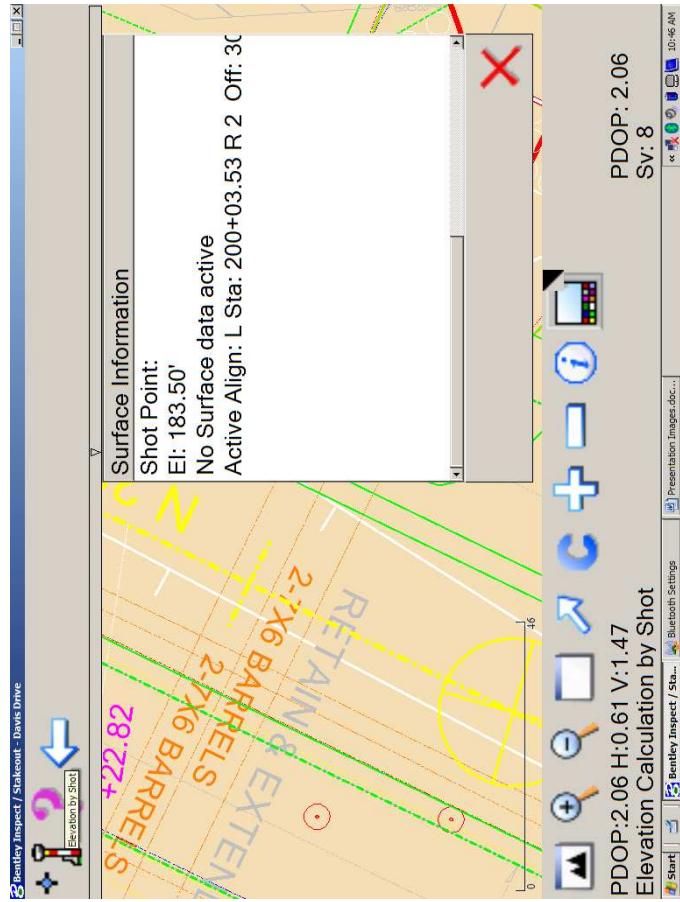
# OnSite Goals

- Inspection - perform inspection duties using survey grade GPS equipment.
- Stakeout - stakeout structures, record stakeout data, modify to meet field conditions
- Other Record Keeping - generate reports, transfer data between users, transfer data to central computer, keep diary



# Inspection

- Show precise location of inspector on project in relation to proposed features using GPS?
  - Does it Work?  
YES!!
  - Can show station, offset, and elevation where you stand



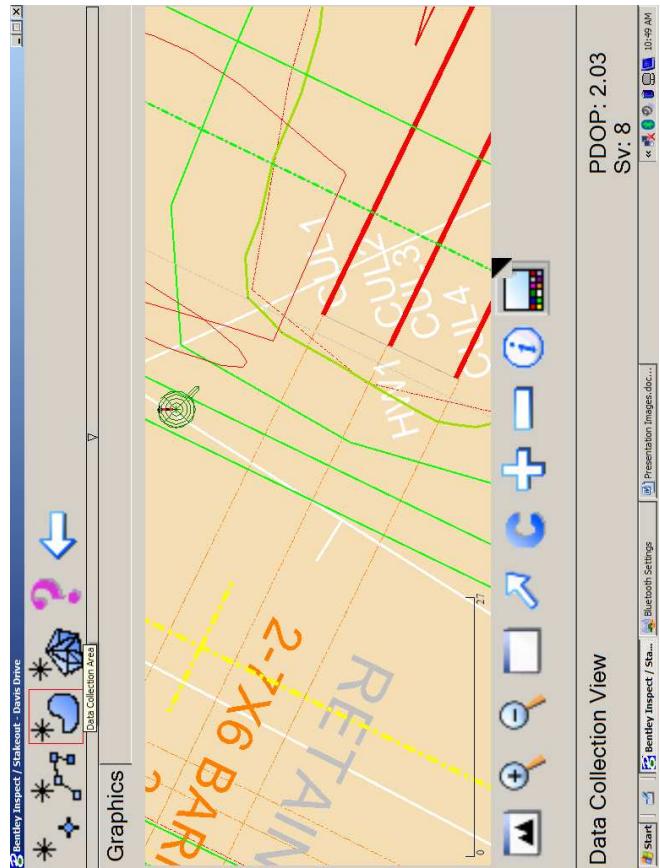
# InSpection

- Show cut/fill at inspector location relative to computer generated 3D model of proposed grade using GPS?
- Does it work?  
Don't know...do not have model for project.
- Intend to acquire contractor's model early this year for trial



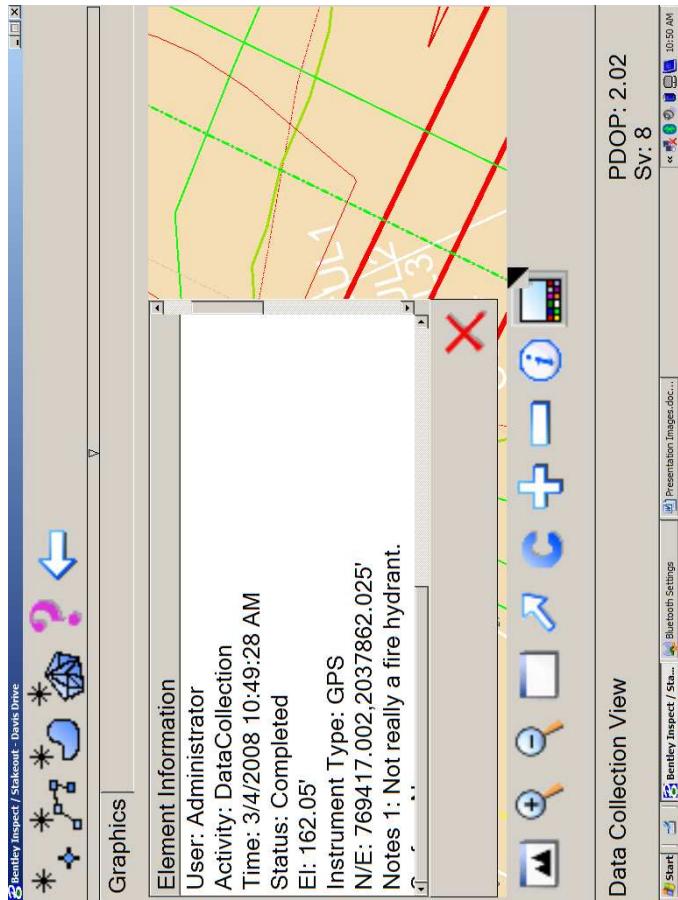
# Inspection

- Inspect linear, per each, area, and volume pay items to include location, quantity, date, and inspector using GPS?
- Does it Work?  
YES.....BUT.



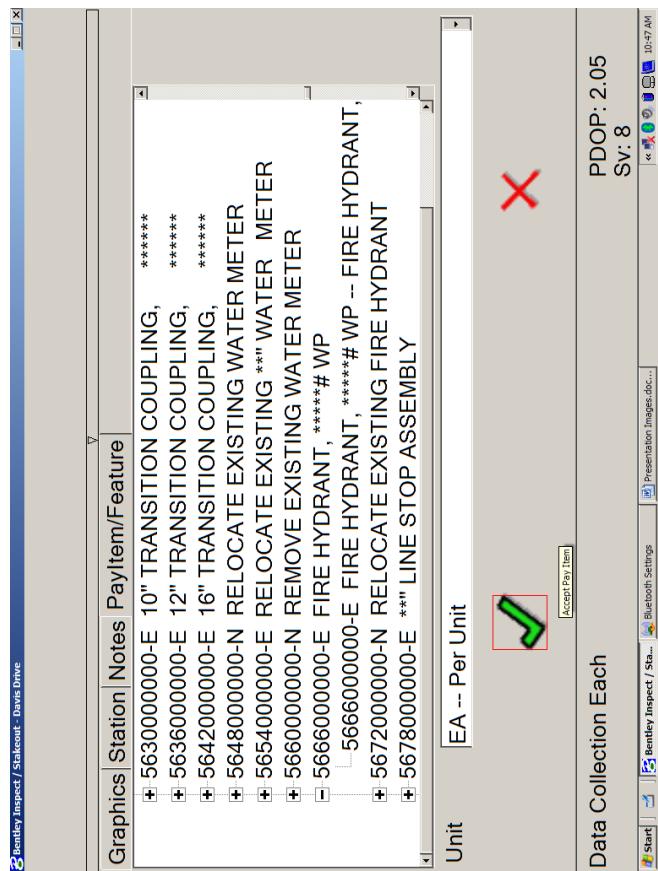
# Inspection

- The YES:
  1. Have used for measuring pipe lengths, curb and gutter, drainage structures, seeding and mulching, and more.
  2. Very easy to measure a linear item (like pipe) and add to the measurement at later date.
  3. Much more accurate for measuring areas.
  4. Can manually enter items without GPS shots if needed.



# Inspection

- The BUT:
  1. Cannot sync with HICAMs yet.
  2. No report that can be generated for payment purposes without data manipulation in spreadsheet.
  3. Design files don't have pay items associated with them during design. This requires inspector to sort through master pay item list to find the item they are inspecting.



Graphics	Station	Notes	PayItem/Feature
[+]	5630000000-E	10"	TRANSITION COUPLING, *****
[+]	5636000000-E	12"	TRANSITION COUPLING, *****
[+]	5642000000-E	16"	TRANSITION COUPLING, *****
[+]	5648000000-N	RELOCATE EXISTING	WATER METER
[+]	5654000000-E	RELOCATE EXISTING	*** WATER METER
[+]	5660000000-N	REMOVE EXISTING	WATER METER
[=]	5666000000-E	FIRE HYDRANT, ****# WP	
	5666000000-E	FIRE HYDRANT, ****# WP -- FIRE HYDRANT,	
[+]	5672000000-N	RELOCATE EXISTING	FIRE HYDRANT
[+]	5678000000-E	**# LINE STOP ASSEMBLY	

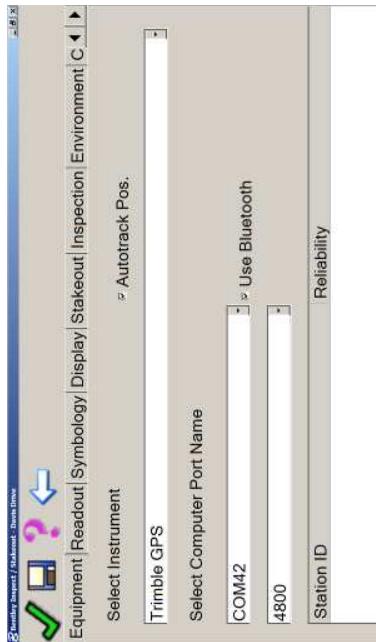
# Inspection

- The Good:

1. More information associated with pay record than in pay record book (Coordinates, time, notes, pictures, etc.)

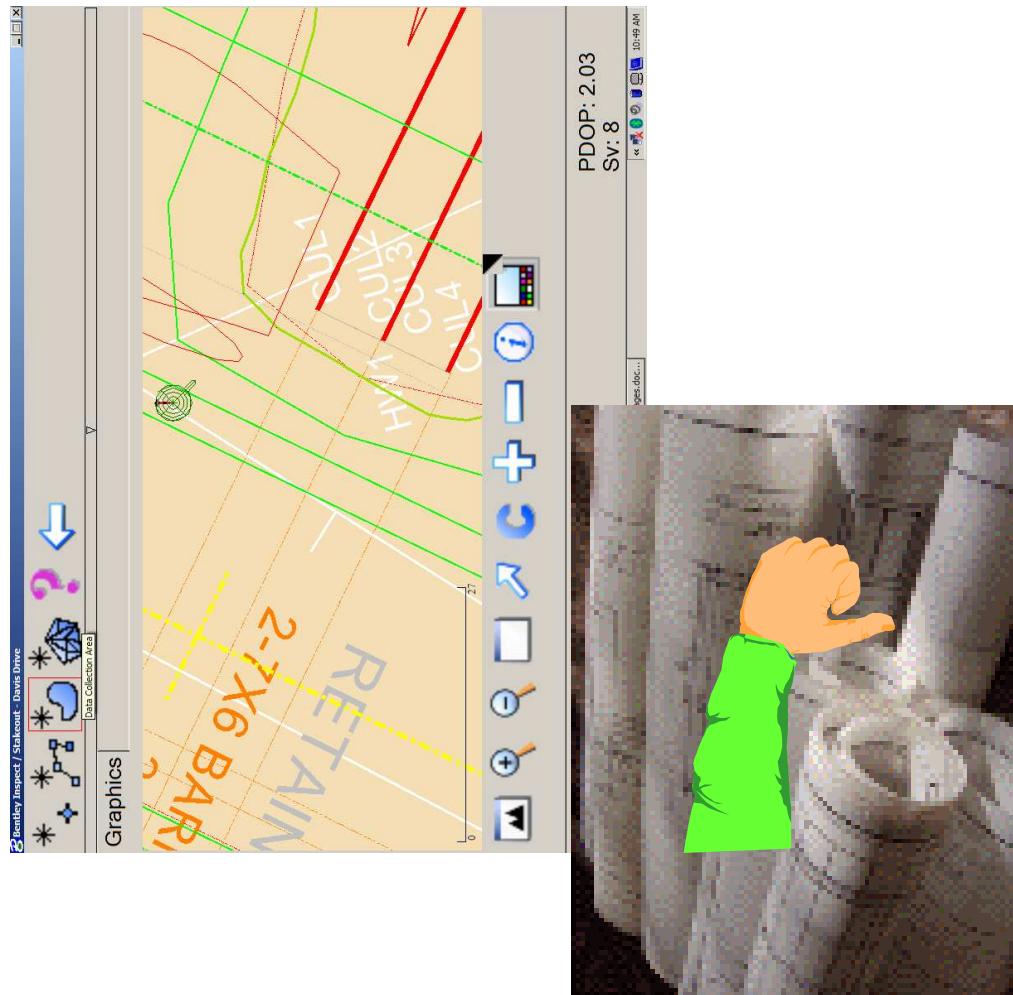
2. Fairly easy for anyone to use with minimal training.

3. Could help with eliminating calculation errors.



# Inspection

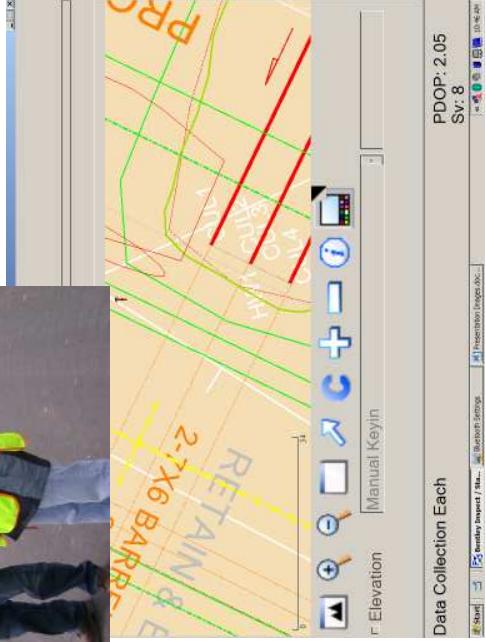
- The Good:
  4. Combines all individual inspections into a single field book.
  5. Less paper needs to be carried in field.
  6. Graphics-based, comprehensive history of all inspection activities: who, date, weather, etc.
  7. Project personnel know what's been done and if it's been inspected



# Inspection

- The Bad:

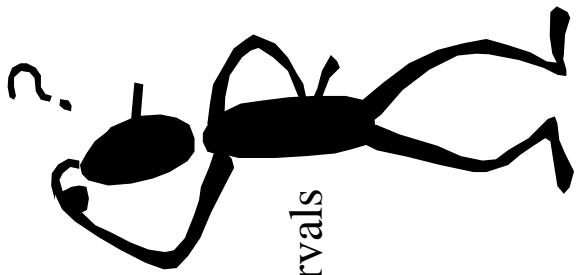
1. To much stuff for one person to carry easily (requires laptop, GPS receiver, data collector, cell phone).



2. Plans need pay items associated with them during design process.
3. No easy way to output all of the data you collect.

# Inspection

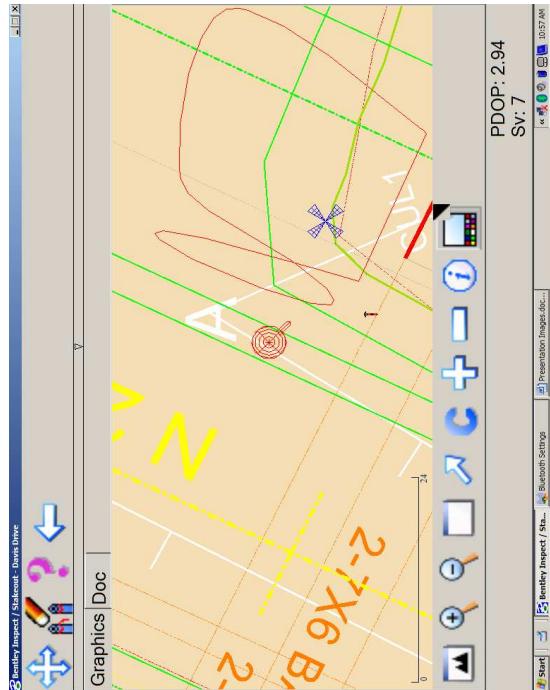
- The Unknown:
  1. Working with Location and Survey Unit to minimize equipment needed and increase ease of use.
  2. Sync with HICAMs. (Imagine no more red books or material receipt reports....well as of now keep imagining)
  3. Potential to prompt inspectors for sampling quantities at appropriate intervals not yet explored but possible.
  4. Potential to link items to specification documents, standard drawings, or inspection checklists not yet explored but possible.
  5. Only using for Roadway and Erosion Control. Have not included Utility Construction or Structure plans for trial.



# Stakeout

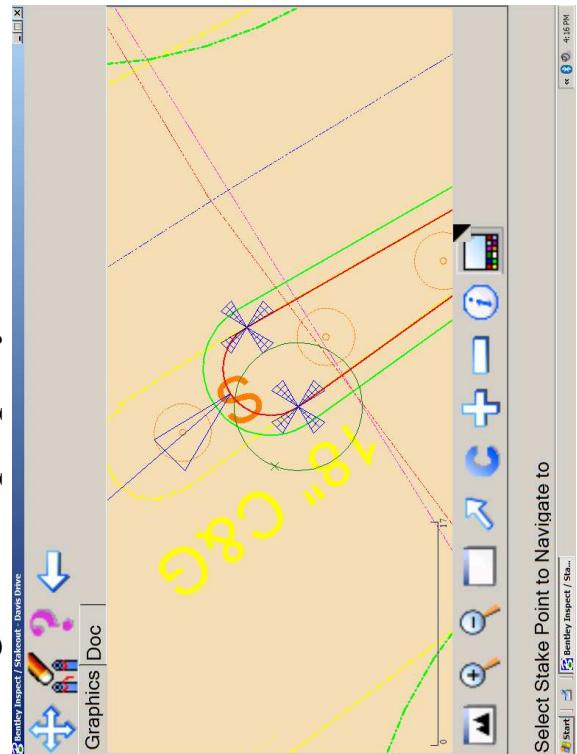
- Potential Advantages:

1. Allows every inspector to be his own survey party if needed.
2. Allows inspectors to verify contract survey.
3. Can record stakeout data and keep notes and pictures associated to every item staked.
4. Can modify proposed design to meet field conditions, record changes, and share with other users.



# Stakeout

- What's Been Tried:
  1. Verification of drainage structure stakeout by contract surveyor.
  2. Used as “preliminary” stakeout tool to show location of pavement, drainage structures, and curb and gutter to property owners and utilities



# Stakeout

- What Hasn't:
  1. Modification of proposed design during stakeout (adding a box or section of pipe, etc.)
  2. Calculating cut and fill values after manually locating the point; calculate what's in the field and instantly produce calculations onsite (need model before this can be done)

# Other Record Keeping

## What Works:

- Maintain Project Diary
- Transfer Data Between Users
- Transfer Data to Central Computer

## What Kind of Works:

- Discussed driveway closure w/ Supt. Approx 1 more week duration. Area still needs to be capped with surface. Will monitor through this week as temps. are high enough to pave surface.

## Still A Work In Progress:

- Generate As-Built Drawings
- Can data from field be output into standard reports?

The screenshot shows the Bentley Inspector software interface. At the top, there are icons for adding (+), deleting (trash), searching (magnifying glass), and saving (disk). Below these are tabs for Diary, Notes, and Graphics. The main area displays a list of diary entries under the heading 'Diary Entries:'.

Category:	Weather
Label	Temperature
Value	50

Below the diary entries, there is a table titled 'Bentley Inspector / Stakeout - Drive Drive' with columns for Text, Picture, Audio, and Sketch. A note states: 'Discussed driveway closure w/ Supt. Approx 1 more week duration. Area still needs to be capped with surface. Will monitor through this week as temps. are high enough to pave surface.'

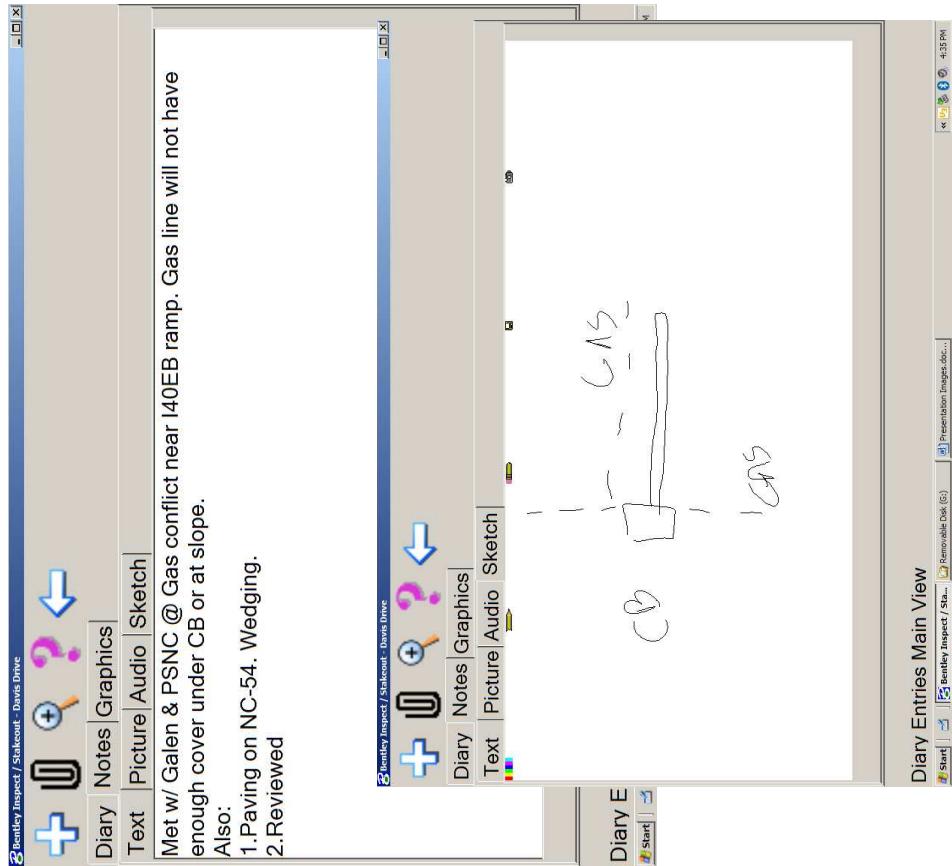
At the bottom right, there is a status bar with icons for battery, signal, and time (4:24 PM).

# Other Record Keeping

## Maintain Project Diary :

1. Allows inspectors to enter in notes, audio, video, pictures, and sketches

2. Diary can be attached to location on plans



# Other Record Keeping

Maintain Project Diary :

1. Work needed on allowing for inputs required for standard diary form and method for output to standard diary form.



# Other Record Keeping

Transfer Data Between Users and Transfer Data to Central Computer:

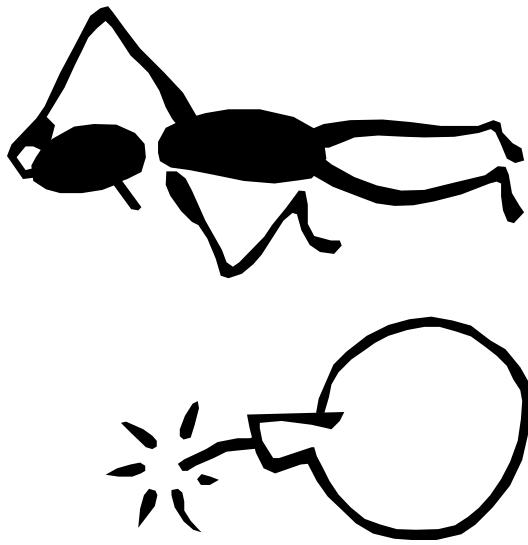
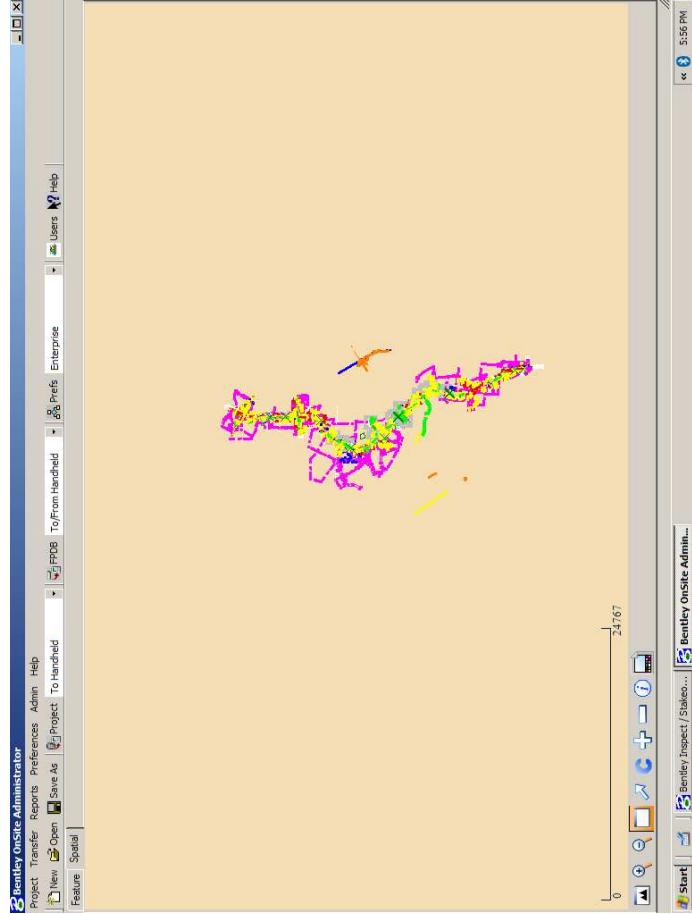
1. Process still needs to be refined and simplified.
2. Allows all users to have the same information in the field and engineering personnel to have the same data in the office.



# Other Record Keeping

Still A Work In Progress:

- Generate As-Built Drawings?



# Other Record Keeping

## Still A Work In Progress:

- Can data from field be output into standard reports as opposed to this?

# The Potential

## Improve Project Performance and Delivery

- Project personnel will always know what's been done—staked out, checked, constructed — Every step that takes place is tracked. This means that you will always have current, accurate information on the project — and hopefully complete as-built information at the end.

## Empower the Entire Field Team

- Using the same information, survey crews, inspectors, and construction management work together, compiling the construction information on a routine basis. Individual team members can view stakeout and inspection activities performed by other team members and everyone works out of same playbook.

# And What The Potential Helps Us Avoid



Questions?